CLAIMS

1. A wind turbine generator including a pitch-angle control mechanism for controlling a pitch angle of windmill blades on the basis of a blade-pitch-angle command, the wind turbine generator comprising:

an accelerometer, attached to a nacelle, for detecting the acceleration due to vibrations of the nacelle; and

an active damping unit for calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the acceleration detected with the accelerometer and for outputting a blade-pitch-angle command to the pitch-angle control mechanism.

2. A wind turbine generator including a pitch-angle control mechanism for controlling a pitch angle of windmill blades on the basis of a blade-pitch-angle command, the wind turbine generator comprising:

an accelerometer, attached to a nacelle, for detecting the acceleration due to vibrations of the nacelle;

an active damping unit for calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the acceleration detected with the accelerometer and for outputting a blade-pitch-angle command for damping;

a pitch-angle control unit for calculating a pitch angle of the windmill blades for controlling the output of the wind turbine generator to be a predetermined value on the basis of wind speed, the rotational speed of a windmill rotor, or the output of the wind turbine generator and for outputting a blade-pitch-angle command for output control; and

an adder for supplying the pitch-angle control mechanism with a blade-pitch-angle command obtained by combining the blade-pitch-angle command for damping output from the active damping unit with the blade-pitch-angle command for output control output from the pitch-angle control unit.

3. The wind turbine generator according to claim 1, wherein the active damping unit includes

a speed estimation unit for estimating a speed from the acceleration detected with the accelerometer, and

a control unit for calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the speed output from the speed estimation unit.

4. The wind turbine generator according to claim 3, wherein the speed estimation unit integrates the acceleration detected with the accelerometer to calculate the speed.

5. The wind turbine generator according to claim 3, wherein the control unit includes a phase-lead compensator for advancing the phase of the speed output from the speed estimation unit by a predetermined amount, and calculates the pitch angle on the basis of the speed obtained after the phase-lead compensation.

6. The wind turbine generator according to claim 5, wherein the control unit includes a phase-lag compensator for delaying the phase of the speed output from the phase-lead compensator by a predetermined amount, and calculates the pitch angle on the basis of the speed obtained after the phase-lag compensation.

7. The wind turbine generator according to claim 3, wherein the control unit includes any one of a proportional controller, a proportional-integral controller, a proportional-integral-derivative controller, a linear-quadratic regulator, and a linear-quadratic Gaussian regulator to which the speed estimated by the speed estimation unit is input to calculate the pitch angle.

8. The wind turbine generator according to claim 1, wherein the active damping unit includes a limiter for limiting the pitch angle of the windmill blades or the angular speed of the

pitch angle of the windmill blades to a predetermined range.

9. An active damping method of a wind turbine generator including

a pitch-angle control mechanism for controlling a pitch angle of windmill blades on the basis of a blade-pitch-angle command, and

an accelerometer, attached to a nacelle, for detecting the acceleration due to vibrations of the nacelle, the active damping method comprising:

an active damping step of calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the acceleration detected with the accelerometer and outputting a blade-pitch-angle command to the pitch-angle control mechanism.

10. An active damping method of a wind turbine generator including

a pitch-angle control mechanism for controlling a pitch angle of windmill blades on the basis of a blade-pitch-angle command, and

an accelerometer, attached to a nacelle, for detecting the acceleration due to vibrations of the nacelle, the active damping method comprising:

an active damping step of calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the acceleration detected with the accelerometer and outputting a blade-pitch-angle command for damping;

a pitch-angle control step of calculating a pitch angle of the windmill blades for controlling the output of the wind turbine generator to be a predetermined value on the basis of wind speed, the rotational speed of a windmill rotor, or the output of the wind turbine generator and outputting a blade-pitch-angle command for output control; and

an addition step of supplying the pitch-angle control mechanism with a blade-pitch-angle command obtained by combining the blade-pitch-angle command for damping in the active damping step with the blade-pitch-angle command for output control in the pitch-angle control step.

11. The active damping method of a wind turbine generator according to claim 9, wherein the active damping step includes

a speed estimation step of estimating a speed from the acceleration detected with the accelerometer, and

a control step of calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the speed estimated in the speed estimation step.

12. The active damping method according to claim 11, wherein the speed estimation step integrates the acceleration detected with the accelerometer to calculate the speed.

13. The active damping method of a wind turbine generator according to claim 11, wherein the control step includes a phase-lead compensation step of advancing the phase of the speed estimated by the speed estimation step by a predetermined amount and calculates the pitch angle on the basis of the speed obtained after the phase-lead compensation.

14. The active damping method of a wind turbine generator according to claim 13, wherein the control step includes a phase-lag compensation step of delaying the phase of the speed output from the phase-lead compensation step by a predetermined amount and calculates the pitch angle on the basis of the speed obtained after the phase-lag compensation.

15. The active damping method of a wind turbine generator according to claim 11, wherein the control step includes a compensation step of performing any one of a proportional control, a proportional-integral control, a proportional-integral-derivative control, a control using a linear-quadratic regulator, and a control using a linear-quadratic

Gaussian regulator for the speed estimated by the speed estimation step and calculates the pitch angle on the basis of the speed obtained after the compensation.

16. The active damping method of a wind turbine generator according to claim 9, wherein the active damping step includes a limiting step of limiting the pitch angle of the windmill blades or the angular speed of the pitch angle of the windmill blades to a predetermined range.

17. A windmill tower comprising a wind turbine generator including

a pitch-angle control mechanism for controlling a pitch angle of windmill blades on the basis of a blade-pitch-angle command,

an accelerometer, attached to a nacelle, for detecting the acceleration due to vibrations of the nacelle, and

an active damping unit for calculating a pitch angle of the windmill blades for generating a thrust on the windmill blades so as to cancel out the vibrations of the nacelle on the basis of the acceleration detected with the accelerometer and for outputting a blade-pitch-angle command to the pitch-angle control mechanism.